and especially at, inter alia, Table 1, pages 27-30, Ex. Comp. Nos. (1)-(46), (50)-(55), (57)-(66), (68)-(79), (81)-(94), (96)-(131), (134)-(137), (139)-(146), (148)-(150), (152)-(154), (157) and (159)-(161). Accordingly, Applicants submit that no new matter has been added.

The Examiner objected to the drawings as allegedly failing to comply with 37 C.F.R. § 1.84(p)(5). Specifically, the Examiner alleged that reference number 17 in Fig. 1C and reference number 24 in Fig. 2 are not mentioned in the specification. With respect to reference number 17, Applicants would like to bring the Examiner's attention to the specification at page 4, lines 18 and 26, where it is clearly set forth that reference number 17 refers to the diffusion-prevention layer.

With respect to reference number 24, the metal electrode noted on page 34, line 22, is represented by reference number 24 in Figure 2. Page 34 clearly sets forth that a metal electrode is formed on the organic lamination layer 23; Figure 2 clearly indicates that 24 is formed on 23. Accordingly, Applicants have amended the specification at page 34 to appropriately insert --24-- after "metal electrode" in order to correct this obvious error. Applicants submit that no new matter has been added and respectfully request withdrawal of the Examiner's objections to the drawings.

The Examiner objected to the abstract for allegedly containing more than 150 words. Accordingly, Applicants have amended the abstract to address this informality and respectfully request withdrawal of the Examiner's objection premised thereupon. In addition, Applicants have generally amended the specification in order to correct minor typographical or clerical errors, as well as to more closely conform to proper idiomatic English. Applicants submit that none of the amendments to the specification add new matter to the application.

Claims 1-3 stand rejected under 35 U.S.C. § 112, second paragraph. In response to the Examiner's concern about the phrase "capable of", Applicants have amended each of claims 1, 2, 4 and 5 to replace that phrase with --optionally--. Applicants submit that it is now clear that the presence of the recited substituents is optional where indicated in formula (1). Applicants accordingly request withdrawal of this rejection.

Claims 1-3 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent Application Publication No. 2002/0034656 (Thompson) in view of George R. Newkome et al., "Synthesis and Characterization of Novel Palladium

(II) Cyclometallated Complexes of 2-Vinylpyridine Derivatives," 9 Organometallics 1375-1379 (1990) (Newkome). Applicants respectfully traverse this rejection.

The present invention is principally directed to a metal coordination compound having only two or three identical ligands, each having an alkylene group and an N-containing cyclic group. The use of such a metal coordination compound in an electrical device or a display apparatus achieves a high efficiency luminescent state for a long period of time. See, e.g., Examples 1-12 and Comparative Example 1.

Thompson is likewise directed to metal coordination compounds. As noted by the Examiner, Thompson discloses vinylpyridine ligands which have an alkylene group and an N-containing cyclic group in Figure 49 and in paragraphs [0048], [0049], [0052] and [0183]. However, the vinylpyridine ligand shown in Figure 49, as well as all the other ligands shown in Figure 49, are intended for use in a metal coordination compound having the formula L_2MX. See, Thompson, paragraph [0109]. As set forth throughout the Thompson reference, L and X are "distinct" or "inequivalent" bidentate ligands. See, Thompson, abstract and paragraph [0183]. Accordingly, Thompson fails to teach or suggest a metal coordination compound having only two or three identical ligands, each having an alkylene group and an N-containing cyclic group.

Further, Thompson also discloses a metal coordination compound having the formula L_3M; this metal coordination compound has three identical ligands. However, the ligands for L_3M do not appear to be the same as those for L_2MX. Specific examples of L_3M are $Ir(ppy)_3$ and derivatives thereof. See, Thompson, Examples 2-5. Such a metal coordination compound is employed in Comparative Example 1 of the present application. As indicated therein, $Ir(ppy)_3$ provides a shorter luminescence half-life than the presently claimed metal coordination compounds. Accordingly, Thompson again fails to teach or suggest a metal coordination compound having only two or three identical ligands, each having an alkylene group and an N-containing cyclic group.

Newkome does not remedy the deficiencies of Thompson. In fact, Newkome was cited by the Examiner merely for its disclosure of α vinyl substitution. Newkome discloses metal coordination compounds, wherein different ligands including a vinylpyridine ligand are attached to a metal atom. However, Newkome, not unlike

Thompson, fails to teach or suggest a metal coordination compound having only two or three identical ligands, each having an alkylene group and an N-containing cyclic group.

In sum, neither of the cited references, whether considered alone or in combination, render the present invention obvious. Most importantly, neither Thompson nor Newkome nor a combination thereof teaches or suggests the key feature of the presently claimed metal coordination compounds, namely the presence of only two or three identical ligands, each having an alkylene group and an N-containing cyclic group. Accordingly, Applicants submit that the present invention is not obvious in light of the cited references and respectfully request withdrawal of the §103 rejection.

In view of the foregoing amendments and remarks, favorable reconsideration and passage to issue of the present case are respectfully requested.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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VERSION SHOWING CHANGES MADE TO SPECIFICATION

The paragraph beginning on page 1, line 5, and ending on page 1, line 15, has been amended as follows:

The present invention relates to a metal coordination compound, an electrical device using the metal coordination compound and a display apparatus using the device. More specifically, the present invention relates to an organic metal coordination compound having [a] formula (1) appearing hereinafter as a luminescence material so as to allow high luminance for a long period of time, an organic luminescence device using the metal coordination compound and a display apparatus including the luminescence device.

The paragraph beginning on page 2, line 17, and ending on page 2, line 25, has been amended as follows:

The luminescence layer 12 may be formed of, e.g., an aluminum quinolinol complex (representative example thereof may include Alq3 described hereinafter) having an electron transporting characteristic and a luminescent characteristic. The hole transport layer 13 may be formed of, e.g., biphenyldiamine derivative (representative example thereof may include α-NPD described hereinafter) having an electron donating characteristic.

The paragraph beginning on page 4, line 2, and ending on page 4, line 12, has been amended as follows:

On the other hand, different from the above fluorescence (luminescence) via a singlet exciton, phosphorescence (luminescence) via a triplet exciton has been studied for use in an organic EL device as described in, e.g., "Improved energy transfer in electrophosphorescent device" (D. F. O'Brien et al., Applied Physics Letters, Vol. 74, No. 3, pp. 442-444 (1999)) and "Very high-efficiency green organic light-emitting devices based on electrophosphorescence" (M. A. Baldo et al., Applied Physics Letters, Vol. 75, No. 1, pp. 4-6 (1999)).

The paragraphs beginning on page 7, line 12, and ending on page 8, line 9, have been amended as follows:

The use of phosphorescence based on the transition from the triplet excited state has also been proposed in, e.g., Japanese Laid-Open Patent Application (JP-A) 11-329739, JP-A 11-256148 and JP-A 8-319482.

However, the above-mentioned organic EL devices utilizing phosphorescence experience [have accompanied with] problems such as [of] a lower luminescence efficiency and stability thereof (luminescent deterioration), particularly in an energized state.

The reason for luminescent deterioration has not been clarified as yet but may be attributable to such a phenomenon that the life of a triplet exciton is generally longer than that of a singlet exciton by at least three digits, so that a molecule is placed in a higher-energy state for a long period to cause a reaction with ambient substance, formation of an exciplex or excimer, a change in the minute molecular structure, a structural change of the ambient substance, etc.

Accordingly, the (electro)phosphorescence EL device is expected to provide a higher luminescence efficiency as described above, while the EL device is required to suppress or minimize the luminescent deterioration in an energized state affecting the life of the EL device.

The paragraph beginning on page 18, line 11, and ending on page 18, line 19, has been amended as follows:

After the reaction, the reaction mixture was cooled and subjected to extraction with cool water and ethyl acetate. The organic layer was washed with water, followed by distilling-off of the solvent under reduced pressure, to obtain a residue. The residue was purified by silica gel column chromatography (eluent: toluene/THF (tetrahydrofuran)=10/1) to obtain 86.9 g of liquid 2-methyl-2-hydroxy-4-(2-pyridyl)-3-buthine (Yield: 80.6%).

The paragraph beginning on page 34, line 21, and ending on page 35, line 4, has been amended as follows:

Then, on the organic lamination layer 23, a metal electrode 24 comprising a 10 nm-thick Al-Li alloy layer (Li: 1.3 wt. %) and a 150 nm-thick Al layer (disposed on the Al-Li alloy layer) was formed by vacuum deposition (2.7×10^{-3} Pa (= 2×10^{-5} Torr)) with a mask, followed by patterning in a stripe form comprising 100 lines (each having a width of 100 μm and a spacing of 40 μm) arranged to intersect the ITO stripe electrode lines at right angles, thus forming an organic EL device having a matrix of pixels (100 x100 pixels).

The paragraph beginning on page 35, line 21, and ending on page 36, line 6, has been amended as follows:

When the organic luminescence device of the present invention is used as a light source for a printer, for example, the organic luminescence device is formed in a line form and disposed in proximity to a photosensitive drum, thus allowing independent drive of respective device elements as a line shutter to effect desired exposure to the photosensitive drum. Further, when the organic luminescence device of the present invention is used as an illumination device or a back light [backlight] for a liquid crystal display apparatus, compared with the case of an ordinary fluorescent lamp, the organic luminescence device is expected to exhibit an excellent energy saving effect.

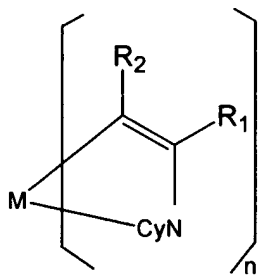
The paragraph beginning on page 36, line 14, and ending on page 37, line 3, has been amended as follows:

As described [herein]above, according to the present invention, it is possible to provide a metal coordination compound of formula (1) exhibiting a higher phosphorescence yield and a shorter phosphorescence life (time) and allowing control of a maximum luminescence wavelength based on a combination of a chain alkene group and an N-containing cyclic group (CyN). When the metal coordination compound of formula (1) is used as an organic (compound) layer of an organic luminescence device, the resultant organic luminescence device exhibits not only a high-efficiency luminescence but also a

high luminance for a long period of time while suppressing a deterioration in luminescence in energized state. Further, it becomes possible to provide an image forming apparatus using the organic luminescence device as a display device.

The Abstract has been amended as follows:

A metal coordination compound suitable as an organic material for a luminescent device is represented by the following formula (1):

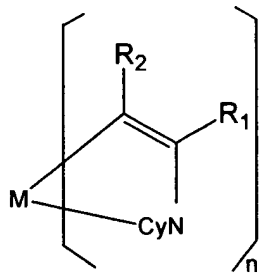


(1)

[, wherein M denotes Ir, Pt, Rh or Pd; n is 2 or 3; R_1 and R_2 independently denote a linear or branched alkyl group having 1 - 20 carbon atoms capable of including one or at least two non-neighboring methylene groups which can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH-, or -C≡C- and capable of including hydrogen atom which can be replaced with fluorine atom; and CyN denotes a cyclic group containing nitrogen atom denotes a cyclic group containing nitrogen atom connected to M and capable of having a substituent selected from the group consisting of halogen atom; nitro group; phenyl group; trialkylsilyl group having 1 - 8 carbon atoms; and a linear or branched alkyl group having 1 - 20 carbon atoms capable of including one or at least two non-neighboring methylene groups which can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH-, or -C≡C- and capable of including hydrogen atom which can be replaced with fluorine atom].

VERSION SHOWING CHANGES MADE TO CLAIMS

1. (Amended) A metal coordination compound represented by [the following] formula (1):



(1),

wherein M denotes Ir, Pt, Rh or Pd; n is 2 or 3; R_1 and R_2 independently denote a hydrogen atom or a linear or branched alkyl group having 1 - 20 carbon atoms [capable of] optionally including one or at least two non-neighboring methylene groups which can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C≡C- and [capable of] optionally including hydrogen atom which can be replaced with fluorine atom; and CyN denotes a cyclic group containing nitrogen atom connected to M and [capable of] optionally having a substituent selected from the group consisting of halogen atom[;], nitro group[;], phenyl group[;], trialkylsilyl group having 1 - 8 carbon atoms[;], and a linear or branched alkyl group having 1 - 20 carbon atoms [capable of] optionally including one or at least two non-neighboring methylene groups which can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C≡C- and [capable of] optionally including hydrogen atom which can be replaced with fluorine atom.

2. (Amended) [A] The compound according to Claim 1, wherein CyN in [the] formula (1) is a cyclic group having a ring structure selected from the group consisting of pyridine, quinoline, imidazole, pyrazole, benzothiazole, benzoxazole, and benzimidazole, and [capable of] optionally having said substituent.

3. (Amended) [A] The compound according to Claim 1 or 2, wherein M in [the] formula (1) is Ir.

4. (Amended) An electrical device[,] comprising:

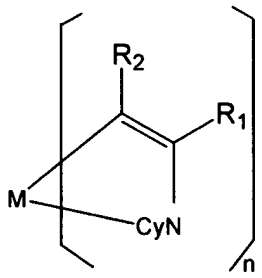
a substrate,

a first electrode disposed on the substrate,

an organic compound layer disposed on the first electrode, and

a second electrode disposed on the organic compound layer,

wherein the organic compound layer [comprising] comprises a metal coordination compound represented by [the following] formula (1):



(1),

wherein M denotes Ir, Pt, Rh or Pd; n is 2 or 3; R_1 and R_2 independently denote a hydrogen atom or a linear or branched alkyl group having 1 - 20 carbon atoms [capable of] optionally including one or at least two non-neighboring methylene groups which can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C≡C- and [capable of] optionally including hydrogen atom which can be replaced with fluorine atom; and CyN denotes a cyclic group containing nitrogen atom connected to M and [capable of] optionally having a substituent selected from the group consisting of halogen atom[;], nitro group[;], phenyl group[;], trialkylsilyl group having 1 - 8 carbon atoms[;], and a linear or branched alkyl group having 1 - 20 carbon atoms [capable of] optionally including one or at least two non-neighboring methylene groups which can be replaced with -O-, -S-, -CO-, -CO-O-, -O-CO-, -CH=CH- or -C≡C- and [capable of] optionally including hydrogen atom which can be replaced with fluorine atom.

5. (Amended) [A] The device according to Claim 4, wherein CyN in [the] formula (1) is a cyclic group having a ring structure selected from the group consisting of

pyridine, quinoline, imidazole, pyrazole, benzothiazole, benzoxazole, and benzimidazole, and [capable of] optionally having said substituent.

6. (Amended) [A] The device according to Claim 4, wherein M in [the] formula (1) is Ir.

7. (Amended) [A] The device according to any one of Claims 4-6, wherein a voltage is applied between the first and second electrodes to cause luminescence from the organic compound layer.

8. (Amended) A display apparatus[,] comprising:
an electrical device according to Claim 7, and
voltage application means for applying a voltage to the electrical device.